

INTEGRATED MANAGEMENT SYSTEM – MANAGEMENT STANDARDS EVOLUTION AND THE IAEA NEW APPROACH

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ABSTRACT

The management standards application began in military and nuclear areas towards the end of Second World War, when some western countries developed quality standards to improve their means to assess suppliers' conditions to assure their products conformance, which was increasingly complex and required a higher degree of reliability. Afterwards, the quality standards application was extended to the consumer market focused on consumers' requirements satisfaction. Coming along the society crescent concern about quality of life, other management standards were developed, such as those dealing with environmental and sustainable development, occupational health and safety, social accountability and so on. As a consequence, the management process became complex. The management system integrated form approach makes possible the compatibility of distinct and complementary interests from several functions and disciplines involved and supply the absence of the organizations' holistic approach. According to this integrated management approach, the Agency - "International Atomic Energy Agency" (IAEA) - decided to review the structure of the 50-C-Q standard - "Quality Assurance for Safety in Nuclear Power Plants and Other Nuclear Installations", from 1996, publishing in 2006 the new GS-R-3 standard - "The Management System for Facilities and Activities - Safety Requirements". This work presents a brief evolution of management standards and integrated management approach, showing the Agency's new vision concerning this issue with the GS-R-3 standard publication.

1. INTRODUCTION

The organizations' decisions to adapt management systems to the established standards for quality, environment, occupational health and safety, social accountability etc, are firstly a question of strategy directly linked to business interests. Furthermore, the fulfillment of those standards is of fundamental relevance and sometimes, obligatory in business segments that require more attention concerning safety, such as the nuclear area. Safety here must be understood in a wider sense, not only limited to nuclear safety context, as defined by International Atomic Energy Agency (IAEA) [15]. Obadia [28] exposes that: "In spite of the expressive development happened in the last decades and the scientific progresses on methods and techniques concerning with work safety and risk management, associated with the industrial processes operation, the occurrence of accidents, in several segments, such as petrochemical, aviation and, more remotely, nuclear, is a findings that management systems characteristics and performance of those organizations still require improvement".

As a consequence of the above mentioned it's understandable how complex the management process for the organizations has become. Within this context, it's the urge of an integrated

management system. A management system is a group of elements (structure, resources and processes), interrelated or interactive, for establishing policies and objectives and accomplishing these objectives [21]. An integrated management system considers the combination of distinct and complementary interests from several functions involved in the organization, such as: quality, environmental, occupational health and safety, social accountability, and others.

The Nuclear Installations utilize and process radioactive materials, as well as others substances usually found in the conventional chemical industry. These profiles inserted the Nuclear Installations in the organizations that require a high level standard of definition, implementation and continuous improvement of their management systems. The involvement of a multidisciplinary approach, leads to consider a holistic perspective of an integrated management system.

Considering this approach of integrated management, the International Atomic Energy Agency (IAEA), henceforth for effect of this article denominated Agency, decided to review the structure of the standard on Quality Assurance - 50-C-Q [7], publishing the standard on the Management System - GS-R-3 [10]. The term "Management System" was considered more appropriate than "Quality Assurance", as expressed in the previous standard, for contemplating the effective management of all activities that are important for the organization and not just those identified through the restricted application of the traditional quality assurance. The management system should integrate all the management processes and activities, in a coherent system that enables the organization to achieve their objectives and mission, in terms of safety, health, environmental, security, quality and economy, while focusing on nuclear safety [8]. It's ones of Agency's scopes of performance setting and promoting the application of international safety standards, for the management of activities within the nuclear area [16],

This article is part of the bibliographic revision of the author's master's degree research project, which intends to establish an integrated management system model applied to an operational stage of the UF6 conversion plants. These plants utilize and process radioactive materials, as well as others substances usually found in the conventional chemical industry and therefore are inserted in the profile of the nuclear installations above mentioned.

The model being described on the research project has as prime objective to contribute to the structuring, adaptation or improvement of management systems by organizations, specifically for the nuclear means, into an integrated management focus. As immediate objective, the model structure could be used as reference in the establishment of the integrated management system for the operational stage of the UF6 Conversion Plant, from Centro Tecnológico da Marinha in São Paulo. This plant is in a construction stage at Centro Experimental Aramar, in São Paulo, at Iperó district, and will be used by the author, as the reference plant, in a validation phase of his research project.

2. EVOLUTION OF THE MANAGEMENT SYSTEM STANDARDS

2.1. Precursory Standards

With the increase in the complexity and in the degree of reliability and safety required by the products used in the military and nuclear areas, towards the end of 2nd World War, western

countries, such as The United States of America, United Kingdom and Canada, began the development and application of quality standards to improve their means to evaluate suppliers` conditions, assuring the products conformity. In this matter some standards stand out:

- a) Military from The United State of America - Mil-Q-9858A “Quality Program Requirements”, from 1959;
- b) Military from North Atlantic Treaty Organization – AQAP “Allied Quality Assurance Procedures Specifications”, from 1968;
- c) Nuclear from The United State of America - USAEC-10-CFR-50, Appendices B “Quality Assurance Criteria for Nuclear Power Plants and Fuel Processing Plants”, from 1960; and
- d) Nuclear from Agency (IAEA) - 50-C/SG-QA “Quality Assurance for Safety in Nuclear Power Plants – Code and Safety Guides”, from 1978.

Afterwards, the quality standards application was extended to the consumer market, whose focus, differing from military and nuclear areas, that commended products with a higher degree of reliability and safety, was to assure the product quality to satisfy the consumers` requirements. SEDDON [20] observed that this type of application also involved international commercial interests, as those from the occident in relation of Japan`s success with the total quality concepts and techniques applications, which was known as the "Japanese Miracle". The United Kingdom was the foremost country to develop commercial quality system standards, whose purpose was to provide a contractual document of common use in the market which permitted demonstrating that the production was controlled; thus the Standard British Institute (BSI) published the standards series BS 5750, in 1979, that was the precursory of the international standards series ISO 9000, of same tenor, published by International Organization for Standardization (ISO), in 1987.

2.2. ISO Quality Standards

The first version of standards series ISO 9000 was published in 1987 focusing on quality assurance, having delineated twenty elements that guided the organizations in the development of their quality procedures. In 1994, the series was revised without great modifications, just a small amplification and some elucidation in their elements, maintaining the same structure. In 2000, the series ISO 9000 [21, 22 and 23] was totally revised. The ISO 9001 [22] and ISO 9004 [23] standards structure was altered; not using the twenty elements anymore. The new model started focusing the process-oriented structure, establishing requirements on quality management system presented in five sections: quality management system, management responsibility, resource management, product realization and measurement, analysis and improvement. The ISO 9000 series, still in vigour, establishes that the organizations should identify their processes and determine their sequences and interactions. The series extended its application purpose, before restricted to the quality assurance, for the concept of quality management, meaning that, more than assuring the conformity of the product, its focus was extended, making explicit the expectations of the management system continuous improvement and tracking customers` satisfaction.

The standards series ISO 9000 has voluntary application character. It focuses the quality management with the objective to achieve the customers` satisfaction.

2.3. Others Management Standards

It is growing the concern of the society with regard to the aspects that affect the life quality, such as those dealing with environmental and sustainable development, occupational health and safety, social accountability, and so on. As consequence, the organizations have been compelled to consider the attendance of those requirements in their existents management system structures, and so the management process became complex. The focus of the organizations, before almost exclusively directed to assist to the consumers' requirements in the sense of maintaining market for their products, comes being enlarged to satisfy others business interested or affected parts requirements. In this context, the international and national regulatory organizations come into developing standards to facilitate organizations to attain others management segments, such as:

a) Environmental - The first subject standard published was the BS-7750 - "Specification for an Environmental Management System", by BSI in 1992. This standard served as base to the publication of the international standards series ISO 14000, by ISO in 1996. The standards series ISO 14000 was reviewed in 2004 [25 and 26], in a way to increase its compatibility with standards series ISO 9000:2000. The purpose was to make easier the implantation of the two management systems (quality and environmental) by the organizations. The standards series ISO 14000 has voluntary application character, having its purpose to supply requirements so that the organizations reach their environmental and economic objectives in an effective way;

b) Occupational Health and Safety (OH&S) – Once again the BSI stood out, as a pioneer in the establishment of management standards, publishing in 1996 the standard BS 8800 [1] that, together with the standards OHSAS 18001[5] and OHSAS 18002 [6], published in 1999 by Health and Safety Commission Executive (HSE), shape what's more current and complete exists today in terms of standards about OH&S management system. Those standards give requirements and establish guides to implant a management system, which enable an organization to control OH&S risks involving in their activities and to improve its performance in this instance;

c) Social Accountability – The Social Accountability International (SAI), affiliated to the Council on Economic Priorities, published in 2001 the standard SA 8000 [17] that presents a management system based in “United Nations Conventions on the Rights of the Child and the Universal Declaration of Human Rights”. Leonard *et al.* [18] explain that: "A voluntary standard SA8000 encourages organizations to maintain and apply social acceptability workplace practices". In September 2004 a Working Group was established within ISO to develop an international standard about the topic to be published in 2008, the ISO 26000 - “Social Responsibility Guidance”. According to ISO [27], this group is appropriately balanced, being composed by representatives of six designated stakeholders' categories: industry, government, labour, consumers, non-governmental organizations and others, in addition to geographical and gender-based balance. ISO is taking this action to ensure a harmonization of interests that will benefit all those with a serious interest in social responsibility.

2.5. The New Approach - Integrated Management System

Griffith [4], in 2000, exposed that: "Over the last decade, ISO 9000 certification has in the main, considered been sufficient to illustrate a company's commitment to deliver a product and service. However, the need to comply with the introduction of new standards, increasingly strict legislation and greater business demands means that companies must also demonstrate improved environmental performance and better health and safety management. ISO 9000 has been joined in recent years by BS 7750 and ISO 14001, the United Kingdom

and international specifications environmental management systems, and BS 8800, the United Kingdom specification for health and safety management systems".

The organizations' decision for adequate management systems establishing for standards about quality, environment, occupational health and safety, social accountability and others is, firstly a question of strategic continuation for their business interests. It must be considered that these kinds of standards applications are a way to facilitate the continuous adaptation of organizations' processes to fulfill the governmental, local, regional and international legislations and regulations, about the themes becoming increasingly more rigorous, as consequence of the society with regard to the aspects that affect the life quality. Furthermore, the fulfillment of these standards is fundamentally relevant and, sometimes, obligatory in business segments that require more attention concerning safety. As example, it's possible to appoint the standards and regulations published for international and national nuclear regulatory bodies, such as GS-R-3 [10], from Agency, and CNEN-NN-1.16 [2], from Comissão Nacional de Energia Nuclear (CNEN) - a Brazilian nuclear regulatory body. These standards are focused in a nuclear safety to ensure the protection of people and the environment, differentiate from those market standards that focus on the consumers' satisfaction with the quality of the product. The standard CNEN-NN-1.16 has obligatory application in Brazil as condition to obtain the nuclear facilities and activities licenses.

As a consequence, it's proven how complex has become the management process by the organizations. In this context, there is a need for one judicious and effective management system that allows the compatibility of distinct and complementary interests, from several functions and disciplines involved in an organization. According to Lopes *et al.* [19]: "The transdisciplinarity becomes the main dynamic of a global organization ...", and still, "... transdisciplinary and not simply multidisciplinary and interdisciplinary".

About the importance in applying integrated management systems Griffith [4] says: "Quality systems have been widely accused of being bureaucratic, costly and with the potential for creating burdensome paperwork [29]. The introduction of more systems may only serve to intensify such an opinion. The quality industry is well aware of such difficulties. In recent years, it has been actively seeking an alternative approach, which has resulted in the development of integrated management systems (IMS) [30]. The IMS seeks to combine similar aspects of different standards in order to simplify management procedures, minimize paperwork and reduce costs".

The integrated management system approach came to supply the lack of more holistic vision by organizations. The holistic concept brings implicit the idea that, added together to constitute a bigger functional unit, the individual components from one system develop non-predictable qualities from their isolated behaviors [3].

3. CONCLUSION

The Agency first version of safety standards series 50-C/SG-QA - Code and Guides - was published in 1978, defining thirteen criteria to be adopted for establishing and implementing quality assurance programs related to the safety of nuclear power plants. In 1996, the series was revised maintaining the same structure of the previous one, having its number changed to 50-C/SG-Q [7], being the Quality Assurance elevated to a General Safety category, for

recognizing the relevance of its application in the other nuclear facilities besides those initially foreseen - nuclear power plants [8].

Adopting the integrated management new approach, the Agency decided to review the structure of the safety standard series 50-C/SG-Q - Code and Guides [7], publishing three new documents:

- a) Standard GS-R-3 - "The Management System for Facilities and Activities – Safety Requirements" [10], which substitutes the code 50-C-Q;
- b) Guide GS-G-3.1 – "Application of the Management System for Facilities and Activities – Safety Guide" [11], which substitutes the guides 50-C-Q1 till Q7; and
- c) Guide in draft form DS349 - "Application of the Management System for Facilities – Safety Guide" [12], which will be substitute the guides 50-C-Q8 till Q14.

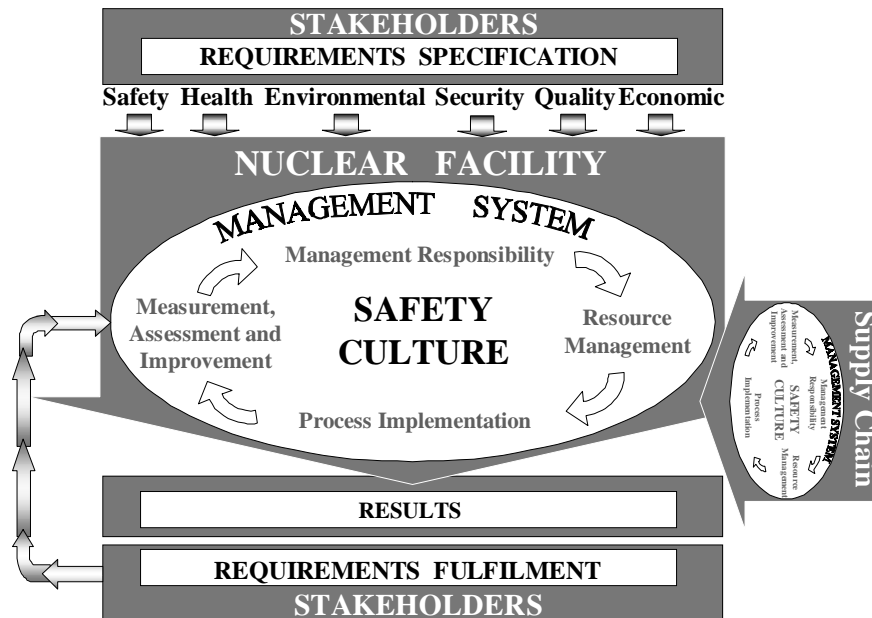


Figure 1. Schematic representation of the organization’s integrated management system.
Source: Adaptation from Figure 2 - “Schematic representation of the components of an integrated management system for an organization”, presented by the Agency [9], pp. 18.

The new standards series (GS-R-3, GS-G-3.1 and DS349) modifies the management focus of the series 50-C/SG-Q, which emphasized the safety aspect into the quality assurance context, enlarging the focus for an integrated management approach, which objective is to assure, in a planned and integrated way the satisfaction of all the parts having an interest in or being affected by the performance of an organization, in terms of safety, health, environmental, security, quality and economic elements. However, the new series continues to give emphasis to the nuclear safety that is the fundamental principle upon which the management system must be based. The management system must be met to ensure the protection of people and the environment. The main objective of the management system must be to ensure that safety won’t be compromised [10].

The new series term "Management System" was considered more appropriate than "Quality Assurance", as expressed in the previous series, for embracing the effective management of all the important organization's activities, and not just those identified through the restricted application of the quality assurance [8].

In the development of the current series (GS-R-3, GS-G-3.1 and DS349) the new structure and the management concepts proposed by the standard ISO 9001:2000 [22] were adopted, as well as the process and the continuous improvement approaches. The standard ISO 14001:1996 [24] aspects were also considered, besides the experience of the Agency's Member States with the development, implementation and improvement of management systems [13].

Figure 1 above shows, in a schematic form, the management system model proposed by the current Agency's standards series. The figure presents the interaction of the organization's components (structure, resources, processes, personnel, equipment, organizational culture and documented policies and processes), inside of a coherent system, that integrates several functions, focused in the effective accomplishment and improvement of their objectives, tends nuclear safety as the main focus. The stakeholder is a person or group having interest in or being affect by the performance of an organization and has typically includes the following: customers, proprietors, operators, collaborators, vendors, partners, unions, professional or business groups, scientific body, member states, important international agencies, agencies and regional bodies, national and local government regulators, the media, the society, the individuals and so on [10 and 14].

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